

KIPPS' LIME-MAGNESIA

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ABSTRACT

Agricultural lime is an important soil supplement that is used to control pH for optimal crop and pasture growth. Burnt lime has been the historic agricultural lime of choice. Between 1925 and 1973, Kipps' Lime-Magnesia won a share of the lime market in Shenandoah and Rockingham counties, Virginia. A comparison of production methods for Meyers burnt lime and Kipps' Lime-Magnesia reveals an unconventional and economically competitive agricultural lime and a historical perspective within the aglime industry.

The Kipps quarry is situated on the eastern flank of Little North Mountain in southwestern Shenandoah County, Virginia and worked the fault breccia of the North Mountain Fault. The magnesium-rich lime product was advertised as lime-magnesia and as marl and marketed as an agricultural lime from 1925 – 1973. E.A. Kipps was able to introduce his unburnt lime product at \$3.00 a ton in a locality where burnt lime was marketed at \$6.00 a ton. Sales records from 1925 to 1972 reflect the influences of mechanization,

economy, climate, World War II, and market competition. In 1972 the Kipps Family sold the business and property to C.S. Mundy Quarries, Inc., who continued operations until the untimely death of their founder, Theodore Mundy.

INTRODUCTION

Agricultural lime is applied to soil to optimize pH for arable crop or pasture use. At near neutral pH, major plant nutrients are utilized more efficiently and some herbicides are more effective. Other benefits of liming include enhanced soil structure in clayey soils, which aids drainage, aeration, and root anchorage. Because calcium and magnesium are removed from soil by plant uptake and leaching, even soil developed on limestone (calcium carbonate) and dolostone (calcium-magnesium carbonate) bedrock may need liming.

The term agricultural lime, or aglime, refers to both lime (calcium oxide, also called quick lime, or in a hydrated state as calcium hydroxide, also called slaked lime) and limestone (or dolostone) materials. Lime is produced by

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calcining (burning) limestone (or dolostone). Historically, commercial lime was produced in rock/brick-constructed kilns. With the exception of marls (fine-grained, unconsolidated deposits of calcium carbonate) or limestone or dolostone fines that were the waste products of mining and milling other mineral commodities, limestone products could not economically compete with burnt lime until the development of relatively modern crushing and grinding technologies.

To contrast the uniqueness of Kipps' Lime-Magnesia (Figure 1), an annotated description of a nearby traditional lime operation is presented. Accounts of the actual operations of lime and other mineral producers are rare in the literature. Within most competitive industries, the release of detailed descriptions of methods and production figures can help competing producers in limited markets. Thus, the revelation of operation methods and production information for individual mineral producers provides an exceptional and important opportunity in our understanding of applied and economic geology. The Kipps operation is significant, because it spans a significant period of time and advances in technology.

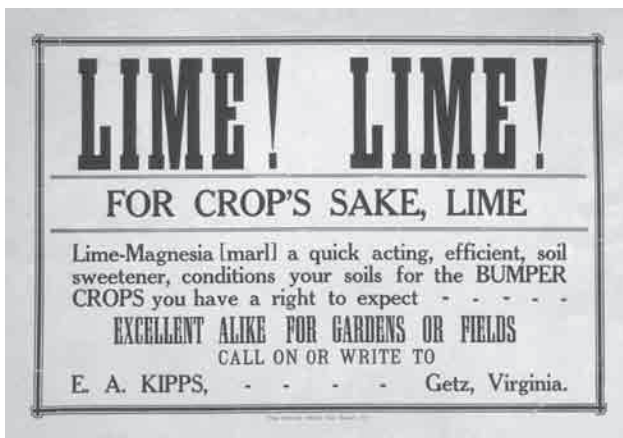


Figure 1. Advertising poster, circa 1926, for Kipps' Lime-Magnesia.

MEYERS LIME KILN

The Meyers lime kiln (Figure 2) was built of limestone from the New Market, Lincolnshire, and Row Park Formations by Christian Meyers in the early 1900s. It is located immediately east of the present town limits of Broadway, approximately 900 feet west of the intersection of State Highway 259 and State Highway 42, and south of State Highway 259 (Figure 3). This particular kiln was charged with a base course of wood and coke, followed by an alternate layer of high calcium limestone approximately 8 to 10 inches thick, overlain by a layer of coke approximately 4 to 5 inches thick, and so forth altering limestone and coke to the final limestone

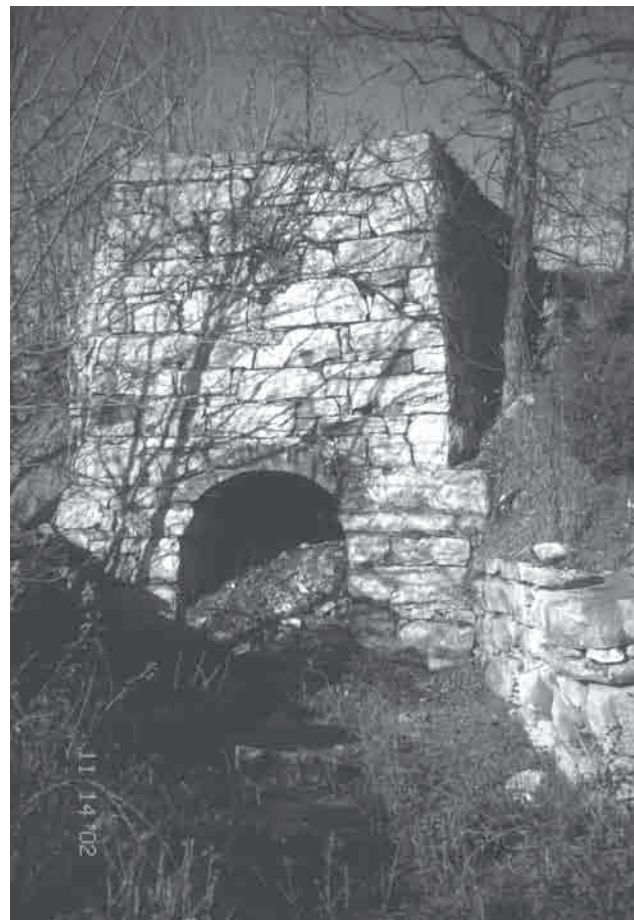


Figure 2. Meyers lime kiln, built in the early 1900s in Rockingham County, Virginia.

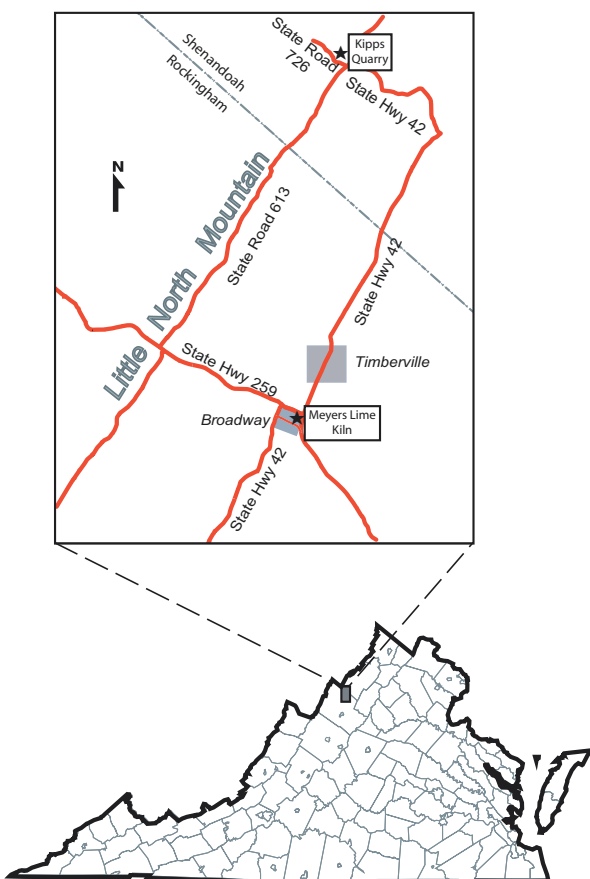


Figure 3. Location of Meyers lime kiln and Kipps quarry.

layer at the top of the oblong, brick-lined furnace chamber. The high calcium rock of the New Market Limestone was blasted from a small quarry, now covered with fill, a few hundred feet to the southwest and transported to the kiln by a railed cart. The charged kiln burned for a couple of days before the high-calcium limestone (CaCO_3) was completely oxidized to quick lime (CaO).

Harvesting the quick lime was an unenviable job. The men wore bandanas across their faces and shoveled as much of the still warm lime as they could before the lime dust and heat overwhelmed them. Quick lime is highly reactive with water in an exothermic reaction that can bring water to a boil. Exposed skin was seared as lime dust reacted with sweat. Some of the quick

lime was hydrated by adding water to form slaked lime. Meyers' lime products included both quick and slaked lime.

Norvell Trumbo (personal communication, 2002) estimated that his grandfather Christian Meyers fired the kiln three to four times a year from the early 1900s until 1928 or 1929. In addition to the use of this burnt lime for agriculture, customers used it for white-washing fences, tree bases, and roadside markers. Modern rotary kilns subsequently replaced the stone-constructed kilns for burnt lime production.

KIPPS' LIME-MAGNESIA

In marked contrast to the conventional quarrying and calcining of high-calcium limestone at the Meyers quarry and kiln site, the overlapping period production of Kipps' Lime-Magnesia brought about a significant change in the local lime market. The Kipps quarry is located on the eastern flank of Little North Mountain at a water gap, Kipps Gap, in southwestern Shenandoah County, Virginia (Figure 3) and sited on the North Mountain Fault. The mountain building forces that thrust older rock units over younger rock units, also crushed the rock along the zone of movement. The ore is a fault breccia and locally consists of ground matrix of dolomitic limestone (magnesium-rich calcium carbonate) and dolostone (calcium and magnesium carbonate) and coarser carbonate rock fragments of the Beekmantown Formation (foot-wall unit, or rock unit under thrust fault) and Elbrook Formation (hanging-wall unit, or rock unit displaced over foot-wall unit).

Beginning Operations

The initial idea for the quarry dates to the fall of 1914, after the rerouting of State Road 726 from streamside to a new hillside cut. A neighboring farmer from Hepner, located on the west side of Little North Mountain, stopped to examine the light olive gray colored soil exposed between tree roots in the new road bank.

Satisfied by what he saw, John Runion, walked to the Kipps' house and asked if he could dig some "fertilizer." Somewhat surprised by the request, Elmer Allen Kipps (Figure 4) told his neighbor to go right ahead and dig a load. Mr. Kipps subsequently sent a sample for identification and learned it was a carbonate of calcium and magnesium. Elmer Kipps knew that calcium and magnesium are important to plant growth.

In 1918, concern about his potential role in the World War prompted Elmer to sell his livestock and farm equipment and rent the farm before traveling to Washington, D.C. He was not drafted and although successful over the next few years in white-collar business in Washington, D.C., Elmer was intrigued about the commercial potential of his fertilizer. He learned that most agricultural limes were deficient in magnesium, which his lime product contained.

Elmer resumed management of his farm in 1922 by traveling back and forth between Washington and Getz, located 2000

feet southwest of present day Getz Corner, to supervise a full-time farmhand. In addition to replacing his farm equipment, he bought an end-gate spreader (Figure 5) with which to spread and test his magnesium-rich lime at the accepted rate of 2 tons per acre. The following year, he sent a sample of his magnesium-rich material for detailed analysis (Figure 6) and started promoting its use to friends and neighbors. He offered the lime-magnesia free for the taking and even loaned his spreader for its application. In 1924, Elmer married his sweetheart, Nenetah Kerlin, and moved back to Getz. Enthusiastic friends and neighbors, satisfied with the unusual magnesium-rich agricultural lime, were spreading word of Kipps' Lime-Magnesia. Locally, burnt lime was shipped into the Mt. Jackson area and sold for \$6.00 per ton. Elmer Kipps decided to price his lime-magnesia at \$3.00 per ton to overcome any reluctance of farmers to switch to his new unburnt lime supplement. On August 22, 1925, J.F. Lonas became the first customer of the new business by paying \$6.00 for two tons of Kipps'



Figure 4. Photograph of Elmer Allen Kipps, circa 1924.



Figure 5. Illustration of an end-gate spreader in operation from old Stover Lime Pulverizer brochure. Note even distribution of lime, which obscures view of lower rear wheels. One person drove the team, while a second shoveled lime into the spreader unit, mounted on the wagon's end gate.

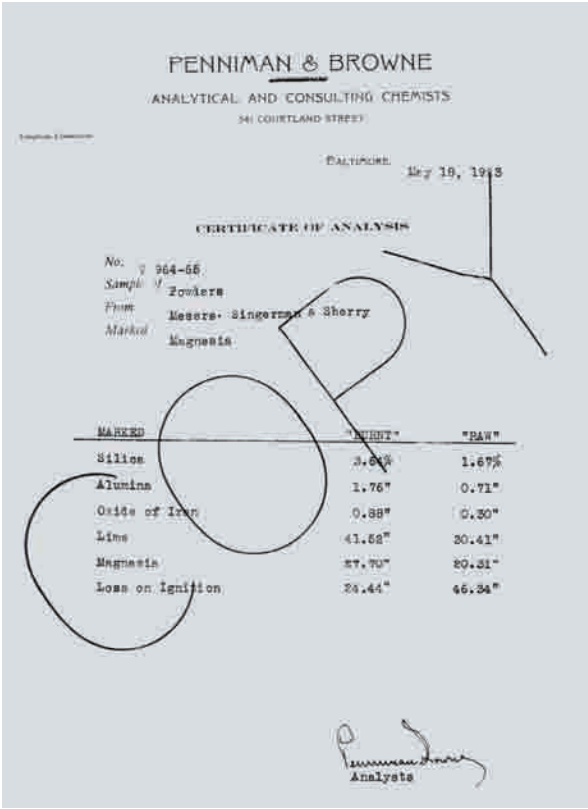


Figure 6. An analysis of the Kipps’ “fertilizer.”

Lime-Magnesia. By year-end, Elmer Kipps had sold 42.7 tons of agricultural lime (Table 1). The magnesium-rich ground limestone product of the Kipps’ operation was registered as an Agricultural Lime starting in 1926 (Figure 7).

At \$3.00 a ton, Elmer Kipps was making a nice profit. Although he blasted to loosen the mixture of compacted fine-grained matrix and coarser rock fragments, no heavy equipment was needed to excavate and crush the rock nor was a kiln needed to burn (calcine) the magnesium-rich carbonate rock into a burnt lime - as was the case for his competitors. During the first ten years of the operation, mining and processing were accomplished by the use of hand tools, wheelbarrows, and a hand screen (Figure 8). During this phase of the operation, two men could screen 10 tons of agricultural lime during a 10-hour day. Mr. Kipps’ promotion of his lime product reached a new level with the printing and distribution of a poster advertising Kipps’ Lime-Magnesia (Figure 1).

Table 1. Tonnages sold by year, from 1925 through 1972, to farmers (column 1) and to Valley Fertilizer of Mt. Jackson (column 2 – limited to years 1950-56).

Farm Tonnage		Fertilizer Tonnage	
1925	42.7		
1926	90.25		
1927	85.05		
1928	22		
1929	189		
1930	349		
1931	81.5		
1932	107.5		
1933	3		
1934	41		
1935	61.5		
1936	1965.6		
1937	1585.3		
1938	1840		
1939	2191.1		
1940	2452.3		
1941	2257.9		
1942	1611.5		
1943	1704.8		
1944	1568.6		
1945	3173.3		
1946	4219		
1947	3608.9		
1948	1650		
1949	2846.6		
1950	3179		724
1951	2374		1048
1952	1775		766
1953	1398.6		825
1954	731.7		748
1955	665.9		737
1956	841.2		353
1957	593.4		
1958	519.6		
1959	1509.8		
1960	2595.2		
1961	2575.5		
1962	2909.4		
1963	3815		
1964	3109.8		
1965	2951.6		
1966	3735.3		
1967	2904.2		
1968	3731.1		
1969	3543		
1970	3552.6		
1971	3369		
1972	3095.3		

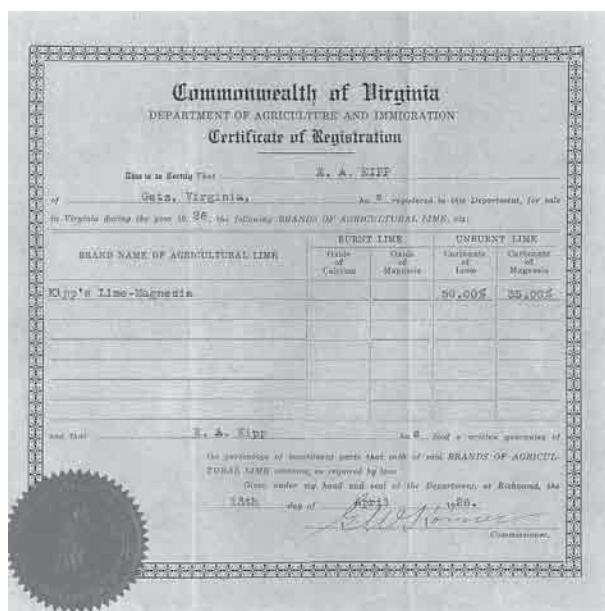


Figure 7. First “license” for Kipps’ Lime-Magnesia as a registered agricultural lime.



Figure 8. View of Kipps quarry with hand-screen leaning against quarry wall at right edge of photograph.

The economic effects of the stock market crash of 1929 are not reflected in Kipps’ agricultural lime sales. During the Spring of 1929, sales were brisk enough for Mr. Kipps to purchase a new 1929 Chevrolet truck to replace a 1923 International 2-ton truck encumbered with solid rubber tires. The increased efficiency in hauling with the 1929 truck allowed enough additional sales that Mr. Kipps was able to buy a new car for his family in 1930. Although economic pressures of the ensuing depression were initially less in this farming community, a drought simultaneously affected the Shenandoah Valley. The combined effects are reflected as a decline in Kipps’ lime product sales from 349 tons in 1930 to a low of 3 tons in 1933 (Table 1). During 1934, the drought eased. Modest sales increases occurred over the next few years. Additional interest in Kipps’ agricultural lime was generated by Moore and others’ 1931 Shenandoah County Geography Supplement. The report was published by the Shenandoah School Board and discussed in the county public school geography classes. Shenandoah County farmers learned about E.A. Kipps’ unburnt lime product from other farmers as well as from their sons and daughters. As in the 1926 poster (Figure 1), the Supplement referred to the unburnt agricultural lime as marl. Marl is a naturally occurring unconsolidated fresh water calcium carbonate material that superficially resembles Kipps’ lime-magnesia and deposits of marl actually occur along the stream on the Kipps’ farm. Marl has been used as an agricultural lime elsewhere in the Shenandoah Valley (Hubbard, and others, 1985; Giannini, 1990; Sweet and Hubbard, 1990). The lime-magnesia differs from marl chemically by having a significant percentage of magnesium and it originated as a fault zone crushed carbonate. The interest generated by the Geography Supplement was largely masked by diminished demand during the drought and production limits prior to the mechanization of 1936.

Mechanized Operations

In 1936, E.A. Kipps started advertising

his new business address at the Moores Store Post Office, Social Security payments for workers were required of industrial and commercial operations, soil conservation aid allotments for lime started, and E. A. Kipps began the mechanization of his agricultural lime operation. The closing of the nearby Getz Post Office in March of 1935, posed problems for Mr. Kipps' advertising and mail. The Getz Post Office literally had been located up the hill from the quarry, a mere 2100 feet to the southeast. The Moores Store Post Office was only two miles to the southwest, but the change required additional advertising to maintain business - even though the operation had not moved (Figure 9).



Figure 9. Advertising poster, circa 1936, for Kipps' Lime-Magnesia at Moores Store Post Office.

The 1936 taxation of industrial and commercial businesses for employee wages initiated a new era with respect to employee benefits and records. Elmer shifted his men from a 10-hour to an 8-hour workday and increased their pay from \$1.25 to \$1.40 a day. Employee records, over the years 1936 to 1950, reveal that no less than 86 local individuals worked for the Kipps' Lime-Magnesia operation (Appendix I).

The Soil Conservation and Domestic Allotment Act of 1936 was designed to support farm income by promoting soil-conservation and soil-building practices. Participating farmers could be reimbursed up to 50 percent of the cost of liming fields, but they had to layout funds prior to reimbursement. Kipps' new poster (Figure 9) alluded to the Government aid, in the form of "substantial refunds for lime," available to farmers complying with the "Soil Conserving" provisions.

The 1936 mechanization of the Kipps' Lime-Magnesia operation was of major significance. The J.B. Hammer Mill, used at Madden quarry in nearby New Market, was purchased and moved onsite to handle increasing amounts of rock found in the deposit. An old International Harvester Titan Tractor, formerly used by the Shenandoah County Highway Department, was bought to power the mill. To handle the increase in production, a 50-ton storage bin was built by George Green and E.A. Kipps (Figure 10).

Production soared from 61.5 tons in 1935 to a total of 1965.6 tons for 1936 (Table 1, Figure 11). The increases in production were required to meet an increase in demand. The first order of 1936 was for 231 tons, more than the production of each of the previous years, except 1930. This large order was placed by C.C. Bowman who was particularly interested in the high-quality magnesium-rich agricultural lime for his fields as well as his orchards. Although mechanization was not completed until August of 1936, day and night operation resulted in an order of magnitude increase in production. The new levels of production prompted a separation of production and distribution. Marvin L. Lutz and his sons:



Figure 10. First storage bin (50-ton capacity) after completion, with Elmer A. Kipps in foreground and 11-year-old Elmer C. Kipps with shovel of milled lime from the J.B. Hammer Mill.

Alton “Bus” M. Freeman and Hirlye Ray Lutz, took over the business of delivering and spreading Kipps’ Lime-Magnesia.

As with most new systems, a few problems had to be worked out to tune the equipment for maximum efficiency. The elevator for the bin was linked to the hammer mill output, so that fine-grained lime product and rock passed through the mill. Sometimes the fines would cake and clog the mill. In 1937, Mr. Kipps had Bester and Long of Hagerstown, Maryland build a 10-foot by 3-foot cylinder screen to separate the fines from the feed to the hammer mill. A second bin with a capacity of 100 tons was built to house the screen (Figure 12). With the aid of a horse powered pond scoop to dig the unconsolidated lime product, the cylinder screen could process 40 to 50 tons of agricultural lime per day - even without the production of the hammer mill. The

next problem addressed was the excessive wear of the J.B. Hammer Mill’s Babbit bearings. A new 3-hammer Stover Mill (Figure 13) provided a solution in 1938. Production soared to new highs in 1939 and 1940.

World War II affected production by reducing the available workforce, while product demand increased. As the country entered the War, the workforce continued to decline until only two to three additional workers could be found to assist Elmer A. Kipps and his son (coauthor E.C.K.). The nature of the quarry operations was shifted from scooping fines and deepening the quarry to bench shooting the quarry walls in 1942. The working face on the quarry walls was mostly rock. A jaw crusher had been bought to reduce the shot rock before it passed through the cylinder screen and on to the hammer mill. In 1943, a second-hand, Fortson shovel with a three-quarter swing (Figure 14) was purchased from Fred K. Betts III Quarry, Inc. of Harrisonburg to help offset personnel unavailability and the shift in quarrying methods. The domestic wartime petroleum-fuel shortages prompted a conversion to electric power (Figure 15). In 1944, the gasoline rationing, the suspension of domestic automobile production, and the scarcity of rubber for tires had prompted a 1.5 percent transportation tax that was applied to all sales that included hauling. During 1945, a few former workers returned from the war enabling production to reach a new high of 3173.3 tons (Table 1 and Figure 11).

With a renewed work force, even higher production and sales were achieved in 1946. Post-World War II unrest, however, resulted in international economic woes. By 1948, escalating problems in a divided Berlin, Germany threatened to erupt into World War III and the U.S. economy plunged into a recession, which clearly shows up as a precipitous dip in tons sold (Figure 11). The reduction of the transportation tax, to a rate of 1.3 percent on sales that included hauling, was probably an economic stimulus initiative. A program that positively affected area farms during the 1948 economic recession was rooted in the Agricultural Adjustment Act (AAA) of 1938, which supplemented the Soil

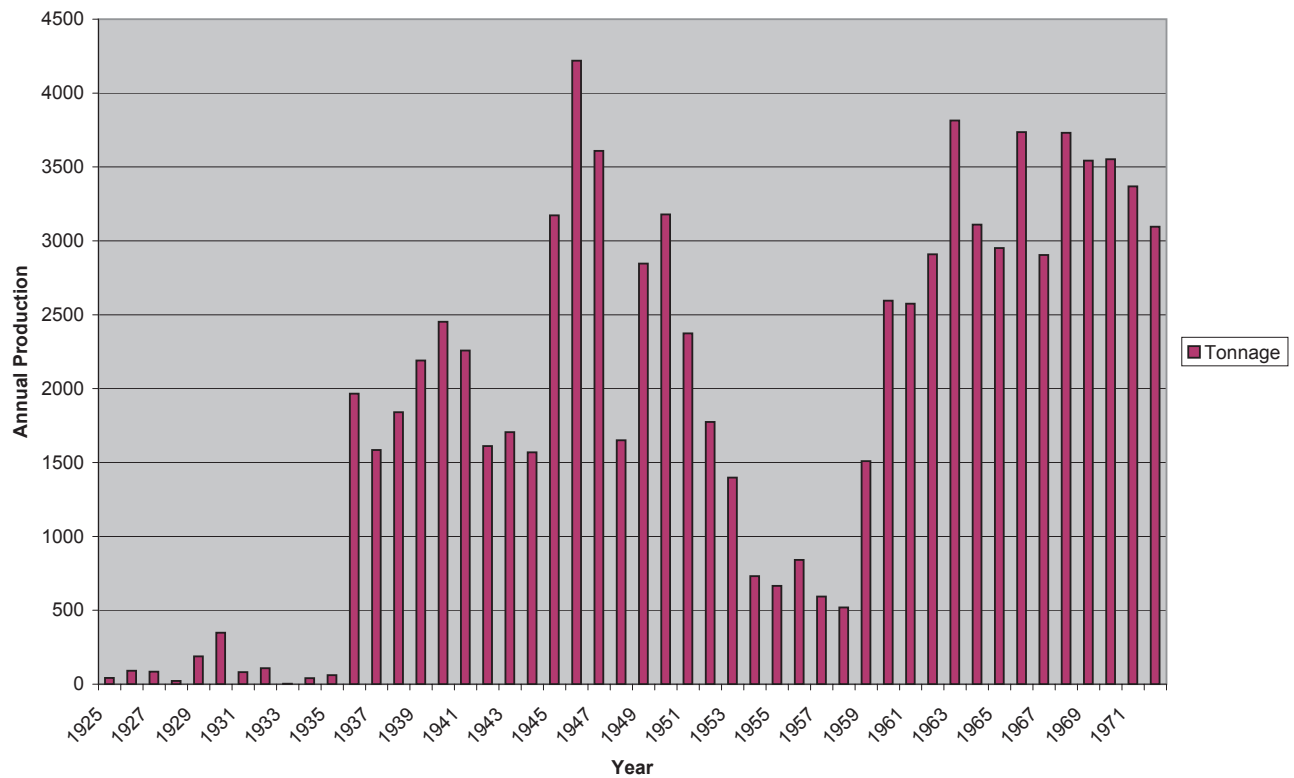


Figure 11. Graph of Kipps' Lime-Magnesia sales to farmers in tons from 1925 through 1972.



Figure 12. View of twin storage bins with elevator feed to cylinder screen housed above 1st bin (100-ton capacity) and Stover Hammer Mill above second bin (50-ton capacity). The hammer mill was powered by a diesel Titan tractor, located behind bins.

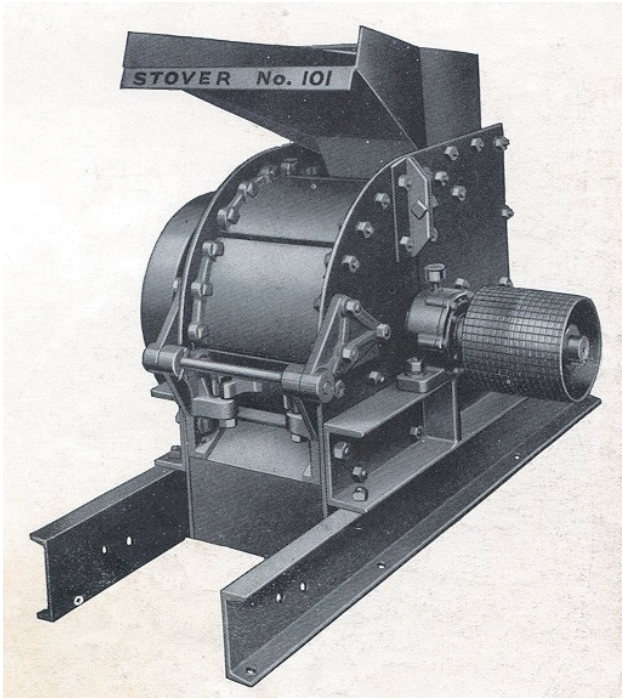


Figure 13. Illustration of Stover Hammer Mill from advertising brochure.

Conservation and Domestic Allotment Act of 1936. These programs were designed to support farm incomes through soil conservation and soil building practices. One such practice was soil testing to determine the amount of lime needed to optimize crop growth and soil conservation. By 1948, county agents could issue farmers purchase orders (POs), also called vouchers, for AAA aid allotments for the amount of agricultural liming needed on particular farm fields. Farmers presenting a voucher to E.A. Kipps paid only half the cost of their lime as opposed to paying the full bill and applying for reimbursement. Lime POs not only reduced farmers' cash outlays, but also provided an indication of the level of local participation in the AAA aid allotment program through Kipps' sales records. In 1948, thirty-four percent of Kipps' lime customers presented AAA vouchers. Increases in lime sales for 1949 (sixty percent of customers used lime vouchers) and 1950 (seventy-three percent of customers



Figure 14. View of Kipps quarry with three-quarter swing Fortson shovel loading 1934 Ford dump-truck. Above quarry face a 1942 Oliver tractor powers an air compressor used to drill holes for bench shots.



Figure 15. Kipps' mill with new REA electrical power substation at right edge of photograph.

used lime vouchers; Table 1 and Figure 11) indicate a recovery from the recession. Increased participation in voucher use suggests increased acceptance of the government sponsored soil conservation initiatives. Subsequent U.S. involvement in the Korean War of 1950 to 1953 resulted in a slide in Kipps' Lime-Magnesia sales.

A number of economic changes occurred during the 1950s that affected operations. The transportation tax was reduced in 1950 to a rate of 1.24 percent on sales that included hauling. A set of scales was installed at the quarry in 1953, which eliminated trips to the Farm Bureau or to various other weighing stations to weigh loads greater than the 5-ton capacity of a cattle scale. Additional recessions in 1953 and 1957 are reflected in the sales slump of the early to mid-1950s. Vouchers for AAA aid allotments for agricultural liming were suspended after 1953 when the Agricultural Conservation Program Service took over payments for the program. Farmers were still eligible for lime aid, but they had to pay the whole cost before they were reimbursed. The transportation tax ended with the change in the calendar from 1954 to 1955. The Lutz's sold back their interest in the hauling and spreading of Kipps' Lime-Magnesia in 1955. Henceforth, Kipps' Lime-Magnesia was spread with a Bulkman Spreader mounted on a 1946 Chevrolet truck. Agricultural lime sales were augmented from 1950 through 1956 by sales of lime product to Valley Fertilizer of Mt. Jackson

(Table 1). Valley Fertilizer used Kipps' Lime-Magnesia as a filler/supplement for their fertilizer. A recovery in lime product sales to farmers began in 1956, but the death of Elmer A. Kipps (age 76) on 1 January 1957 stalled operations. Legal matters took a year to settle before Mrs. E.A. Kipps (Figure 16) could assume control of Kipps' Lime-Magnesia. Elmer C. Kipps, her son, had managed the quarry operations and distribution of the product during the transition year and was named General Manager in 1958. E.C. Kipps' well-schooled sister, Erma Kipps, took over the bookkeeping after the death of her father. Market competition added an additional complication when Tri-State Zinc, Inc. opened the Bowers-Campbell mine in nearby Rockingham County in 1957. Finely ground dolomitic host rock, from which the zinc concentrates were separated, was a waste product at the mine. Initially, this ground dolomitic-limestone was marketed as an agricultural lime by Fred K. Betts III Quarry, Inc. and later by the Timberville Lime Company. Despite the increased market competition, a recovery in sales began in 1959.



Figure 16. Mrs. E.A. Kipps managed Kipps' Lime-Magnesia after her husband passed away in 1957, northwest end of quarry and bins are visible over her right shoulder.

The old Fortson shovel was replaced in 1959 by a International TD9 front-end loader (Figure 17). In 1960, a 1955 GMC truck mounted with a Bulkman Spreader (Figure 18) was purchased. The following year, the old 1946 Chevrolet mounted Bulkman Spreader was replaced by a 1957 Chevrolet mounted Bulkman Spreader. That same year, the 3-hammer Stover Mill was replaced with a 39-hammer Jeffrey



Figure 17. E.C. Kipps dumping International TD9 front-end loader into jaw-crusher in December 1959.



Figure 18. E.C. Kipps with the 1955 GMC-mounted Bulkman Spreader on the scales.

Mill, obtained from Mr. Long of the Jamison Black Marble Company of Harrisonburg. The significantly greater power requirements of the 39-hammer mill prompted a shift from electric to diesel power for the milling operations. The worn cylinder screen was replaced by a shaker screen acquired from the old Page County Cooperative quarry (Figure 19), when it was taken over by Theodore W. Mundy of Elkton Lime and Stone Company.

Vouchers for aid allotments for agricultural liming were renewed in 1961 with the shift in authority for aid payments returning to the Agricultural Adjustment Administration (AAA). Mining, milling, and spreading operations continued with only a few changes for the next 10 years. AAA aid allotments for agricultural liming were replaced by Agricultural Stabilization and Conservation Service (ASCS) allotments in 1967 and continued through the duration of Kipps' lime production. A 3.0 percent sales tax took effect at the onset of 1967 and increased to 4.0 percent from July 1968 through the duration of Kipps' Lime-Magnesia production. By 1970, a full-swing Unit shovel (Figure 20) was purchased to load shot rock for processing and the International front-end loader was switched to stockpiling and loading finished lime product.

The year 1972, was a year of significant change for Kipps' Lime-Magnesia. It was the last year the Kipps' Magnesium Limestone quarry was licensed to operate as a mine by the Kipps family (Figure 21). On 13 October 1972, Kipps' Lime-Magnesia was sold to Theodore Mundy of the C.S. Mundy Quarries, Inc. Mr. Mundy hired E.C. Kipps to manage operations. Quarry and agricultural lime operations were shut down at the old Kipps farm after the untimely death of Theodore Mundy, on 8 July 1973.

During the years the Kipps family operated Kipps' Lime-Magnesia (1925-1972), a total of 89,223 tons of agricultural lime were sold to farmers in Rockingham, Shenandoah, Page, and Highland counties in Virginia and Hardy County in West Virginia. Another 3,273 tons of agricultural lime were sold to Valley Fertilizer for use as a supplement/filler for their fertilizer. The



Figure 19. A 1961 photograph of the crew that recovered the shaker screen from old Page County Cooperative quarry. Left to right: Joe May (fed crusher and helped blast), E.C. Kipps (General Manager), Otis Tusing (fed crusher and general quarry work), John Tusing (fed crusher and worked weight station), and Freddie Tusing (operated shovel, dump truck, and loader). Photograph was taken by Nelson Tusing (drove truck and spread lime).



Figure 20. A post operations photograph of E.C. Kipps on the old Unit shovel used in the early 1970s – the last years of operation of Kipps' Lime-Magnesia.

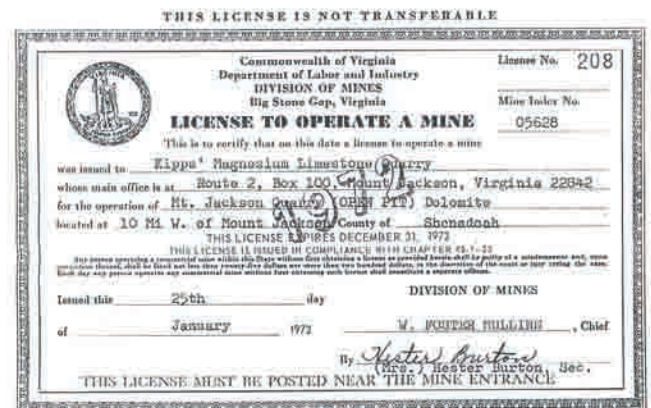


Figure 21. The 1972 license to Kipps' Magnesium Limestone quarry to operate a mine in Virginia.

total of Kipps' Lime-magnesia sold from 1925 through late 1972 was 92,496 tons. Tonnages sold during the Mundy operations are unavailable.

Mr. E.A. Kipps was fond of saying that his was the first unburnt lime operation in northern Virginia. Technically, Kipps' Lime-Magnesia was the second known unburnt lime operation in northern Virginia. Cornwall Lime Marl, of Winchester Virginia, sold 1,942 tons of marl as an agricultural lime in 1923 (Hubbard, and others, 1985, p. 7). No other records of production are known for Cornwall Lime Marl.

Mr. E.A. Kipps once told his son that he had found his pot-of-gold beneath the roots of the old mahogany tree and had pointed to their quarry, where the tree had once stood. Elmer A. Kipps was a man of vision and a man that not only knew an opportunity when he saw it, but a man that was willing and capable of developing his dream into reality. Few are those with vision, fortitude, and entrepreneurship. Fewer still are those who find the end-of-the-rainbow in their own yard.

EPILOGUE

The study of minerals and marls that enhance soil productivity was an interest of William Barton Rogers, who was appointed to undertake a reconnaissance of the geology of the Commonwealth of Virginia in 1835. A discussion of mineral fertilizers was a significant component of Rogers' subsequent report to the Virginia legislature in January 1836 (Rogers, 1884 and Adams, 1998). The economic prosperity of antebellum Old Dominion was linked to her soils and so too were the roots of the Virginia Geological Survey nurtured by the study of her mineral fertilizers.

The legacy of the history and development of Kipps' Lime-Magnesia is a rare treat for those of us that seek to learn more about the practical, applied, and economic geology around us. The rich details, in the form of photographs, records, experiences, and memories, of a significant segment of the Kipps' family history are a rare gift that the co-author has shared with us through this

article. A word of thanks is due to Bob Minnick, who sent the senior author to meet and talk with the co-author, for otherwise the details of the Kipps' Lime-Magnesia operations might never have been put-to-print in such a well illustrated form that charts the development of a part of the aglime industry.

In May of 2001, the old Kipps' farm and quarry were sold to Valley Stone, LLC. The history of Kipps' Lime-Magnesia may have a chapter or two to yet develop.

ACKNOWLEDGEMENTS

Norvell Trumbo, of Broadway, Virginia, graciously led the authors on a tour of the Meyers Lime Kiln and provided the history of grandfather Christian Meyers' mining and lime business. Mr. Trumbo also shared his own childhood memories of the mining and lime kiln operations.

Bill Keith, of the USDA's Natural Resources Conservation Service, provided information about the Soil Conservation and Domestic Allotment Act of 1936 and the Agricultural Adjustment Administration (AAA) programs for soil building practices such as lime applications. He also provided valuable information about the shift from the AAA to the Agricultural Conservation Program Service that accounted for the suspension of AAA lime vouchers from 1954-1960.

Jim Snyder, of the USDA's Natural Resources Conservation Service, indicated that, during 1954-1960, when lime vouchers were discontinued lime reimbursements remained in effect. Peter Warren, the Albemarle County Extension Agent, provided information about the beginning of Virginia's soil testing, for optimal soil pH and lime needs, circa 1938.

DMME/DMR personnel that contributed to this article include Karen Hostettler, who prepared the digital graphics version of Figure 3. Eugene Rader and Palmer Sweet enhanced the article by providing information and suggesting changes to improve the manuscript.

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Appendix I. A partial list of employees who worked for Kipps Lime-Magnesia from 1936-1950.

Workers**Years employed**

Allbright,	(1940)
Baker, Lester	(1949-50)
Barb, Phillip	(1950)
Beetle, Harold	(1944)
Biller, Allen	(1939)
Biller, C.E.	(1947-48)
Biller, C.L.	(1947)
Biller, Guy	(1938, 1940-41)
Biller, Joe	(1939, 1942)
Biller, J.L.	(1939)
Biller, Lester	(1938)
Byers, O.S.	(1943)
Cline, W	(1940)
Cullers, Warren	(1945)
Custer, Chas. F.	(1939-45)
Custer, Elwood	(1945)
Custer, Iran	(1945)
Custer, Tom	(1942)

Delawder, Braxton	(1945)
Delawder, Bud	(1945)
Delawder, James	(1946, 1948)
Delawder, Jas	(1946, 1948-49)
Dellinger, J. Wilson	(1944)
Dellinger, Stanley T.	(1944)
Estep, Norman	(1949)
Estep, Paul	(1938)
Getz, Milton Allen	(1938)
Getz, J.R.	(1939)
Green, Geo.	(1936-41, 1943)
Halterman, A. F.	(1939, 1944-45)
Halterman, J. Paul	(1937-41, 1943-47, 1949)
Hepner, Arthur J.	(1938, 1940-42, 1945-47)
Hepner, Deryl	(1937-38, 1940-42)
Hepner, Elwood	(1944)
Hepner, Frank	(1938)
Hepner, Orville	(1942-44)
Hepner, Ira "Pete"	(1941, 1943, 1946)
Hepner, Walt	(1941, 1943)
Horn, C.H.	(1944)
Jones, Beverly	(1943)
Kerlin, Derwood	(1946)
Kerlin, Deryl	(1943-44, 1946-47)
Kerlin, R.G.	(1937-42)
Lutz, Bus	(1938)

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Appendix I (cont.).

Workers	Years employed		
Lutz, "Doc"	(1942)	Ryman, Jr.	(1940, 1942-43)
Lutz, Frank	(1944)	Sager, W.L.	(1944)
Miller, C.W.	(1944)	Shamburg, Garland	(1946)
Miller, Roy	(1945)	Silvins,	(1938)
Moomaw, Allen	(1938, 1940-41, 1946-48)	Stroop, Freeman	(1938-39)
Moomaw, Chas.	(1938)	Tusing, Chas.	(1939)
Nicolas, D	(1938)	Tusing, Herbert	(1942)
Richmond, Burtelle "Buck"	(1938-40)	Tusing, Mark	(1941-43)
Richmond, Geo.	(1938-40)	Tusing, Mel	(1936, 1938)
Richmond, Tom	(1937-38, 1940)	Tusing, Otis	(1937-39, 1942-47)
Rupert, Herman	(1941-42)	Vann, R.R.	(1944)
Rupert, James "Jas"	(1939, 1941-42)	Weaver, Arthur	(1938, 1941, 1947-50)
Rupert, Wm	(1938)	Weaver, Grant	(1938-39, 1941, 1943, 1948)
Runion, Dolie	(1942, 1944-45)	Weaver, John	(1950)
Runion, Horace "Hub"	(1942-43)	Weaver, Mathew	(1938)
Ryman, Berlin	(1940)	Weaver, Wesley	(1938)
Ryman, David	(1937, 1946)	Webb	(1938)
Ryman, Elwood W.	(1938)	Wilkins, John	(1944)
Ryman, Lewis	(1942-43, 1946)	Wilson,	(1938)
		Zehring, Berlin	(1937, 1939-41)
		Zehring, D.	(1939)
		Zehring, J. Mark	(1946)
		Zehring, Noble R.	(1936-37)